QB156
.F91

ESTABLISHED IN 1820.

YOUNG & SONS,

No. 43 NORTH SEVENTH ST.,

PHILADELPHIA, PA.

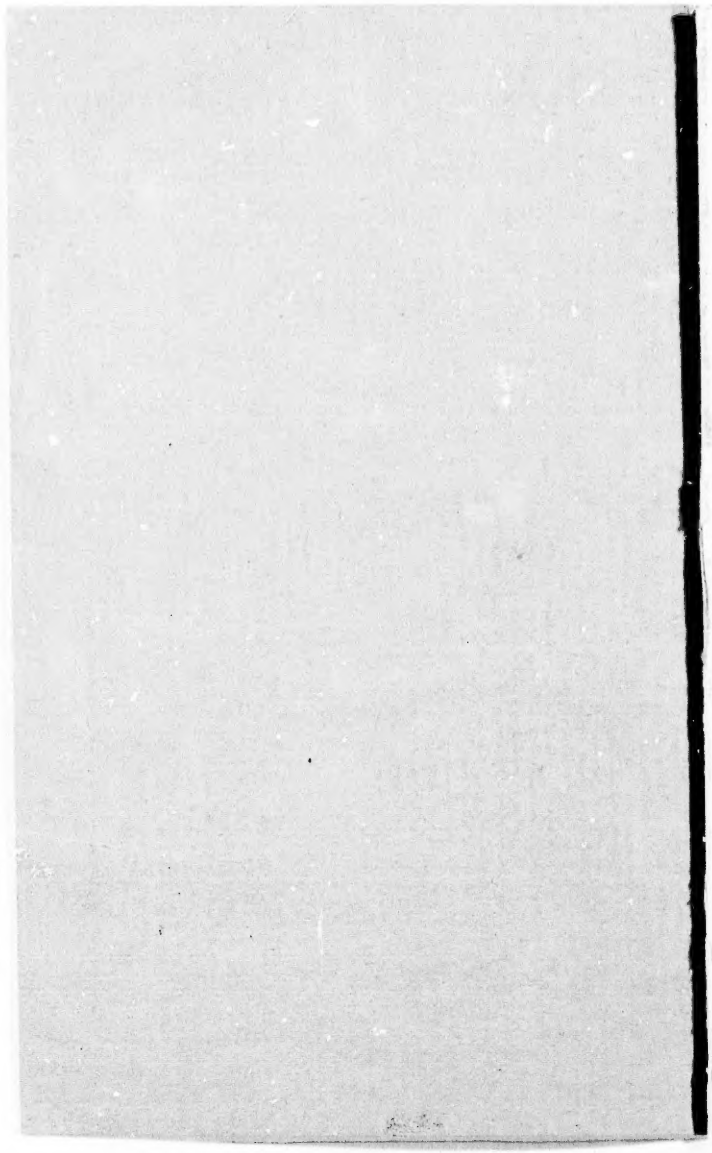
Engineering, Mining, and Surveying Instruments.

Solar Transits, ✓ Fessenden

Solar Compasses,

Solar Attachments.

Catalogues upon Application.



A TABLE

OF

Refractions in Declinations

FOR EVERY 5° OF LATITUDE AND DECLINATION,

FOR USE OF U. S. DEPUTY SURVEYORS.

COMPILED FOR

YOUNG & SONS,

BY HON. CORTEZ FESSENDEN, SURVEYOR GENERAL OF DAKOTA.

1885.

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JUL 20 1885
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LATITUDE 30°.

Hour Angle.	DECLINATION.						DECLINATION.				
	+ 23° 28′	+ 20°	+ 15°	+ 10°	+ 5°	0	− 5°	− 10°	− 15°	− 20°	− 23° 28′
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
Noon.	07	10	15	21	26	33	40	48	57	1 08	1 17
1 hour.	11	11	17	22	28	34	41	49	59	1 10	1 19
2	10	14	19	25	31	38	46	54	1 05	1 17	1 28
3	16	20	26	32	38	46	55	1 06	1 19	1 36	1 49
¼											1 59
½										1 53	2 13
¾									1 42	2 07	2 30
4	27	32	39	46	55	1 05	1 18	1 35	1 56	2 26	2 56
¼							1 29	1 49	2 16	2 56	3 38
½						1 25	1 43	2 09	2 45	3 44	4 56
¾					1 34	1 41	2 05	2 40	3 35	5 18	7 34
5	52	59	1 09	1 23	1 41	2 04	2 39	3 33	5 14	8 53	14 13
¼			1 25	1 42	2 07	2 43	3 40	5 25	9 14		
½		1 26	1 47	2 12	2 51	3 53	5 52	10 12			
¾	1 37	1 52	2 21	3 03	4 16	6 36	11 52				
6	2 08	2 31	3 20	4 47	7 42	14 18					
¼	2 58	3 40	5 25	9 09							
½	4 32	6 08	10 51								
¾	8 04	12 33									
7	17 15										

year 1885, by

ington, D. C.

LATITUDE 35°.

Hour Angle.	DECLINATION.						DECLINATION.					
	+ 23° 28′	+ 20°	+ 15°	+ 10°	+ 5°	0	− 5°	− 10°	− 15°	− 20°	− 23° 28′	
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	
Noon.	12	15	21	26	33	40	48	57	1 08	1 21	1 32	
1 hour.	13	16	21	28	34	41	49	58	1 10	1 25	1 35	
2	16	19	25	32	38	46	55	1 05	1 19	1 35	1 49	
3	22	26	33	39	47	56	1 07	1 21	1 37	1 59	2 21	
¼											2 35	
½									1 56	2 27	2 56	
¾										2 48	3 27	
4	34	39	47	55	1 06	1 20	1 36	1 58	2 31	3 19	4 14	
¼						1 30	1 50	2 17	2 59	4 09	5 37	
½			59	1 12	1 25	1 43	2 08	2 45	3 44	5 40	8 21	
¾						2 03	2 36	3 29	5 08	8 50	14 49	
5	59	1 07	1 20	1 37	1 59	2 30	3 20	4 49	8 05	16 41		
¼			1 35	1 57	2 24	3 16	4 41	7 44	15 34			
½		1 36	1 57	2 28	3 16	4 41	7 41	15 18				
¾	1 42	1 58	2 30	3 18	4 46	7 51	15 38					
6	2 09	2 32	3 23	4 54	8 09	16 24						
¼	2 49	3 27	5 03	8 31	17 19							
½	3 54	5 10	8 12	18 10								
¾	6 00	8 53	18 36									
7	10 41											

LATITUDE 40°.

Hour Angle.	DECLINATION.						DECLINATION.					
	+ 23° 28′	+ 20°	+ 15°	+ 10°	+ 5°	0	− 5°	− 10°	− 15°	− 20°	− 23° 28′	
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	
Noon.	17	21	26	33	40	48	57	1 08	1 21	1 38	1 54	
1 hour.	18	22	27	34	42	50	59	1 11	1 25	1 43	1 57	
2	22	25	31	38	46	55	1 06	1 18	1 35	1 57	2 16	
3	28	32	40	48	57	1 08	1 20	1 38	2 01	2 33	3 07	
¼										2 51	3 32	
½									2 27	3 15	4 09	
¾								2 10	2 47	3 51	5 04	
4	41	46	55	1 06	1 18	1 35	1 57	2 28	3 18	4 44	6 40	
¼							2 14	2 53	4 01	6 18	9 47	
½						2 03	2 38	3 33	5 16	9 25	16 38	
¾					1 56	2 26	3 14	4 37	7 43	16 34		
5	1 06	1 15	1 30	1 50	2 18	3 00	4 12	6 39	13 17			
¼				2 13	2 50	3 54	6 02	11 15				
½		1 44	2 07	2 43	3 41	5 34	10 00					
¾		2 03	2 37	3 32	5 14	9 11	20 11					
6	2 09	2 33	3 25	4 59	8 31	18 22						
¼	2 42	3 18	4 45	7 58	16 48							
½	3 30	4 31	7 24	15 16								
¾	4 49	6 49	13 37									
7	7 19	11 49										
¼	12 40											

LATITUDE 45°.

Hour Angle.	DECLINATION.						DECLINATION.					
	+ 23° 28′	+ 20°	+ 15°	+ 10°	+ 5°	0	− 5°	− 10°	− 15°	− 20°	− 23° 28′
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
Noon.	25	26	33	40	48	57	1 08	1 21	1 38	2 02	2 24
1 hour.	25	28	34	39	49	59	1 11	1 24	1 43	2 08	2 31
2	27	32	38	46	55	1 06	1 19	1 35	1 57	2 27	2 58
3	35	39	47	56	1 07	1 20	1 37	2 00	2 32	3 24	4 24
¼											5 10
½								2 25	3 10	4 33	6 20
¾								2 43	3 43	5 36	8 26
4	48	54	1 04	1 17	1 32	1 53	2 23	3 08	4 27	7 23	12 20
¼							2 44	3 45	5 41	10 45	20 24
½						2 27	3 15	4 41	7 55	17 58	
¾						2 54	4 01	6 19	12 33		
5	1 13	1 23	1 40	2 03	2 38	3 34	5 17	9 33	22 55		
¼					3 13	4 36	7 43	16 56			
½			2 16	2 57	4 07	6 32	13 06				
¾			2 45	3 45	5 41	10 34					
6	2 09	2 34	3 26	5 02	8 48	20 13					
¼		3 10	4 32	7 29	16 16						
½	3 13	4 04	6 26	12 49							
¾	4 07	5 34	10 17								
7	5 35	8 19	19 00								
¼	8 11	14 03									
½	13 21										
¾	23 56										

LATITUDE 50°.

Hour Angle.	DECLINATION.						DECLINATION.				
	+ 23° 28′	+ 20°	+ 15°	+ 10°	+ 5°	0	− 5°	− 10°	− 15°	− 20°	− 23° 28′
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
Noon.	29	33	40	48	57	1 08	1 21	1 38	2 02	2 35	3 09
1 hour.	30	34	41	49	59	1 09	1 24	1 43	2 08	2 44	3 27
2	34	38	46	55	1 05	1 17	1 35	1 57	2 24	3 15	4 07
1/4											4 37
1/2										3 49	5 05
3/4											5 50
3	41	47	56	1 06	1 19	1 35	1 58	2 29	3 18	4 51	6 56
1/4									3 43	5 42	8 43
1/2								3 03	4 18	7 02	11 42
3/4								3 28	5 08	9 16	17 19
4	55	1 01	1 13	1 28	1 48	2 14	2 55	4 04	6 27	13 24	
1/4						2 53	3 22	4 57	8 43	21 30	
1/2						3 26	4 03	6 23	13 06		
3/4					2 33		5 03	8 59	22 13		
5	1 19	1 30	1 50	2 17	3 00	4 12	6 47	14 18			
1/4					3 38	5 27	10 03	25 35			
1/2				3 11	4 32	7 38	17 09				
3/4			2 50	3 56	6 07	12 04					
6	2 10	2 34	3 28	5 05	9 02	21 54					
1/4		3 04	4 20	7 05	15 12						
1/2	2 58	4 32	5 44	10 55							
3/4	3 39	4 47	8 13	19 14							
7	4 35	6 24	13 04								
1/4	6 00	9 14	23 07								
1/2	8 20	14 41									
3/4	12 30	25 14									
8	20 23										

LATITUDE 55°.

Hour Angle.	DECLINATION.						DECLINATION.					
	23° 28′	20°	15°	10°	5°	0	5°	10°	15°	20°	23° 28′	
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	
Noon.	35	40	48	57	1 08	1 21	1 38	2 02	2 35	3 29	4 32	
1 hour.	37	42	49	59	1 10	1 24	1 43	2 08	2 45	3 41	4 55	
2	40	45	54	1 05	1 17	1 33	1 56	2 26	3 13	4 35	6 47	
1/4											7 25	
1/2										5 45	8 42	
3/4									4 05	6 32	10 37	
3	48	54	1 05	1 18	1 33	1 55	2 25	3 11	4 30	7 48	13 43	
1/4									5 20	9 41	18 58	
1/2								3 59	6 17	13 00	27 48	
3/4							3 12	4 37	7 50	18 32		
4	1 02	1 09	1 23	1 41	2 04	2 41	3 39	5 30	10 25			
1/4						3 01	4 16	6 55	15 11			
1/2						3 30	5 08	9 16	24 11			
3/4					2 56	4 04	6 30	13 41				
5	1 25	1 37	1 59	2 33	3 24	5 00	8 51	22 25				
1/4					4 04	6 26	13 20					
1/2				3 24	5 01	8 54	22 28					
3/4			2 56	4 06	6 32	13 41						
6	2 10	2 34	3 27	5 07	9 11	23 25						
1/4			4 11	6 44	14 19							
1/2	2 50	3 31	5 14	9 31	21 40							
3/4	3 18	4 14	6 55	14 50								
7	3 56	5 15	9 38	25 20								
1/4	4 38	6 49	14 41									
1/2	5 58	9 16	24 15									
3/4	7 48	13 32										
8	10 39	21 09										
1/4	15 24											
1/2	23 09											

DECLINATION.

10°	15°	20°	23° 28′
′ ″	′ ″	′ ″	′ ″
2 02	2 35	3 29	4 32
2 08	2 45	3 41	4 55
2 26	3 13	4 35	6 47
			7 25
		5 45	8 42
	4 05	6 32	10 37
3 11	4 30	7 48	13 43
	5 20	9 44	18 58
3 59	6 17	13 00	27 48
4 37	7 50	18 32	
5 30	10 25		
6 55	15 11		
9 16	24 11		
3 41			
2 25			